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Fungi Associated with Soils and Roots of Cucurbits (*Lagenaria guineensis* and *Luffa aegyptica*) in Open Waste Dump Sites

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ABSTRACT: *Cucurbits have been associated with the degradation of solid waste in refuse dump sites, a potential which can be harnessed in the phytoremediation of components of solid wastes. This study examined a total of 84 soil and 84 Cucurbit root samples collected from three (Borokiri, Rugaraga and Eagle Island) waste dump sites for population and diversity of fungi using standard microbiological techniques. Population of soil fungi in dump sites ranged from 2.3 x 10^2CFU/g to 3.1 x 10^3CFU/g soil and in the decreasing order of Borokiri > Eagle Island > Rugaraga. Population of Cucurbit root fungi in the dump sites ranged from 0.2 x 10^2CFU/g to 2.6 x 10^3CFU/g root and in the decreasing order of Borokiri (Lagenaria guineensis) > Rugaraga (Luffa aegyptica) > Eagle Island (Luffa aegyptica). Fungi isolated and identified were Alternaria conidia, Aspergillus fumigatus, Aspergillus niger, Candida albicans, Ceratocystis fimbriata, Fusarium sp., Gelasinospora calospora, Mucor mucedo, Penicillium chrysogenum, Penicillium expansum, Rhizodiomyces apophysatus, Rhizopus stolonifer, Sacccharomyces sp., and yeast. Only Penicillium chrysogenum, Penicillium expansum, and Saccharomyces species were isolated from both soil and root samples from all the dump sites. Alternaria conidia were isolated only from soil samples in Borokiri and Eagle Island dump sites. Gelasinospora calospora was isolated from soil samples in Borokiri and Rugaraga while Rhizodiomyces apophysatus was isolated from soil samples in Rugaraga dump site. Candida albicans was isolated from Curcubit root samples in Borokiri and Eagle Island. Statistical analysis using ANOVA (F-test) varied at 5% level for the fungi population between the different sampling periods.*

Keywords: waste dump soil, cucurbit, roots, phytoremediation, *penicillium*, *saccharomyces*.

INTRODUCTION

Solid waste production are growing rapidly as a result of industrialization and population increases, making garbage pollution a serious problem (Vinti *et al*., 2021; Shah, 2023). A waste is said to be hazardous if it is infectious, meaning containing viable micro-organisms of their toxins which are known or suspected to cause disease in animal or human (Chetan *et al*., 2017). Hazardous waste is any discarded material, liquid or solid, that contains substances known to be fatal to humans or laboratory animals in low doses. It could be toxic, carcinogenic, mutagenic or tetratogenic to humans or other life forms; and hence ignitable ability with a flash point less than 60ºC. They are also corrosive, explosive or highly reactive and undergo violent chemical reactions either by itself or when mixed with other materials (Cunningham *et al*., 2022). Waste disposal poses a threat to both animals and the soil. Like chemical hazards, aetiologic agents, poisonous plants, insects, animal and indigenous pathogens are biological hazards that might be encountered at the waste side (Rim and Lim, 2014).

The soil has been considered convenient repositories for solid and liquid waste. Every year, about 300 metric tons of pollutants, industrial waste, and garbage are deposited into the natural environment. The dumping and burying of solid wastes is done with the mistaken idea that naturally occurring microbes will eventually biodegrade (breakdown) these waste materials but the process has escalated over time (Meyer-Dombard, 2020).

Municipal solid waste generation in Port Harcourt, Nigeria is approximate 96,000 tons yr-1 and is higher than industrial solid waste generation and does not have a sanitary landfill (Moffat and Linden, 1995; and Obire *et al*., 2002). The composition of municipal solid waste in Port Harcourt is food waste, paper cardboard, faeces, screening residual, plastics, broken bottles, batteries, textiles, bones, glass, wood and leaves, ferrous metal, leather and rubber, non-ferrous metal, concrete, and ceramic and hazardous waste (Obire *et al*., 2002).

While the production of waste is global, its management is not the same. In Rivers State and Nigeria as a whole, the mismanagement of waste has impacted negatively on motorable roads, drainage systems and immediate surroundings in the proximity of dumpsites and untreated waste site to agricultural lands and drinking water sources thus resulting to socio-economic and health hazards including a general impact on the ecology of the environment (Obire *et al*., 2002).

Getting contaminants out of soil and ground water is one of the most widespread and persistent problems in waste cleanup. The main method of cleaning up contaminated soil is to dig it up, then decontaminate it or haul it away and store it in a landfill in perpetuity. At a single site, thousands of tons of tainted dirt and rock may require incineration or other treatment. Cleaning up these sites cost lots of money (Cunningham *et al*., 2022).

The Ecosystem is a good model for studying the association and interactions between plants and microorganisms and their relationship with waste and contaminants in the soil. Microorganisms are an essential part of the nutrient cycling and energy flow process of the ecosystem. Their indisputable roles in their degradative and mineralization capabilities in maintaining the carbon balance of the environment have a certain assimilatory capacity for the waste and their biodegradation potential determines the magnitude of this capacity. Therefore, man should not exceed this capacity. The generation and production of contaminants above the acceptable limit result in deleterious impact which is inhibition of nitrification that affects plants communities and this leads to photosynthetic drop that spreads throughout the ecosystem (Merrington and McLaughlin, 2007).

Soil micro-organisms play important role in almost every chemical transformation taking place in the soil. In particular, they can improve the fertility status of the soil and contribute to plant growth (Prescott *et al*., 2005). Similarly, other soil microorganisms have been found to produce compounds (such as vitamins and plants hormones) that can improve plant health and contribute to higher crop yield (Prescott *et al*., 2003). It is known that *Azospirillum* induces the proliferation of plant root hairs which can result in improved nutrient uptake (Cruz-Hernández *et al*., 2022).

The root of plants are involved in the uptake of mineral nutrients and water for plant growth, but they also releases a wide range of organic compounds in the surrounding soil. Many microorganisms are present at higher numbers on the surface of plant roots (Prescott *et al*., 2005).

The process of degradation of waste in waste dump involves not only biological process, but also interrelated physical and chemical processes (Cunningham *et al*., 2022). Most organic materials, many synthetic compounds and some isomers of polychlorinated biophenyls (PCB) can be degraded by microorganisms in the waste dump (Weiland-Bräuer, 2017).

Microbes are sensitive to abrupt changes in their environment. Microbial communities within contaminated ecosystems therefore tend to be dominated by those organisms capable of utilizing and or surviving toxic contaminants (Tahri *et al*., 2013). Plant associated microorganisms reside in the rhizosphere, phyllosphere and inside tissue of healthy plants. They include the Arbuscular mycorrhizal fungi are also referred to as endomycorrhiza i.e. (root colonizing fungi) and Ectomycorrhizae that reside and colonize in the rhizoshpere and endophytic (Cumming *et al*., 2015). They tend to maintain a microniche within the roots of those plants. Rhizofungi are of subset of total rhizosphere fungi which have the capacity, upon re-introduction to seeds or vegetative plant parts to colonize the developing root system in the presence of competing soil microflora. Root colonization is typically examined by quantifying fungal populations on root surfaces.

Rhizofungi and endophytes are part of the natural microflora of healthy plants, they may be considered to be important contributors to plant health and general soil suppressiveness (Cumming *et al*., 2015). Specifically, they play the role of decomposing waste materials so that "liberated nutrients" (like nitrogen, phosphorus and potassium) can readily be taken up-by the hair roots of a plant.

Recently, a number of alternatives have been developed using plants, fungi, and bacterial to clean up wastes (Cunningham *et al*., 2022). These plants have been studied for their ability to remove metals from soils thereby treating waste–soil containing metal contamination (Laghlimi *et al*., 2015). Phytoremediation (remediation, or clean-up, using plants) can include a variety of strategies for absorbing, extracting, or neutralizing toxic compounds such as heavy metals and toxic organic chemicals (Cunningham *et al*., 2022). Radioactive strontium and cesium have been extracted from soil near the Chernobyl nuclear power plant using common sunflowers (Cunningham *et al*., 2022).

The cucurbitaeceae family is a plant group with the most species widely used for bio-remediation as they grow commonly at waste dump sites. Many of the biophysical details are poorly understood, but in general, plant roots are designed to efficiently extract nutrients, water, and minerals from soil and ground water. The mechanisms involved may aid extraction of metallic and organic contaminants (Cunningham *et al*., 2022).

Improper disposal of untreated municipal solid waste is not only harmful to human's health but also constitute a threat to ecological environment (Vinti *et al*., 2021). The future benefits of intervening are commensurably high (Moffat and Linden, 1995). The city of Port Harcourt does not have sanitary landfill but there are several dumpsites in existence in Port Harcourt and its environs. These dump sites are usually surrounded by luxuriantly growing vegetation soil type and other environmental factors control the plant species or population at these dump sites. At the immediate vicinity of the dumpsite, luxuriantly growing or free growing weeds including some cucurbitaceae plants are abundant.

In Nigeria, little information is available on the types of microorganisms associated with soils and roots of Cucurbits in waste dump site (Obire *et al*., 2002). There is therefore the need for the cultivation, enumeration, isolation and identification of fungal isolates associated with the soils and roots of Cucurbits found in waste dump site. The aim of this study is to evaluate the population and diversity of fungi associated with the soils and roots of Cucurbits found in waste dump sites. The findings will assist in the selection and harnessing of fungi with potentials for the degradation of solid wastes.

MATERIALS AND METHODS

Description of the study area

The study areas were the following; The first site is the Eagle Island, an island located South-West of Port Harcourt City. It is bounded on the East by Nkpolu-Oroworukwo (at the University Science and Technology) and surrounded by Elechi creek. It has mangrove vegetation. It is both an industrial and Residential area. The sampling site was an abandoned or active dump located in the Eagle Island. The Eagle Island waste dump site is composed of paper products, cardboard materials, plastics, broken bottles, leaves, food wastes, feces, leather and rubber. It is a waste dump site used by Port Harcourt city council and Environmental Sanitation Authority for solid waste disposal. Most of the wastes disposed were mainly domestic and household wastes. The waste dump had an area of 4,355sq.m. Sampling stations were established on the waste dump site and were represented as stations A and B.

The second site is the Rugaraga, municipal waste dump site in a street located North-West of Port Harcourt City. It is a non-noisy street found after the transformer before reaching the Psychiatric hospital junction in Rumigbo. The sampling site was a borrow pit area used as a dump located immediately after the mechanic village found in the Rugaraga Street. It is a waste dump site used by the community in that area for solid waste disposal. The Rugaraga waste dump comprises of wooden products, batteries, textiles, bones glass, ferrous metal, ceramic and hazardous waste as reported for Port Harcourt waste dump site by Obire *et al.,* 2002. Most of the waste disposed are mainly domestic, household wastes, and of course industrial waste from the mechanic village. The waste dump had an area of 4,000sq.m approximately. Sampling stations were established on the waste dump site and were represented as stations C and D. The Rugaraga Street is both an industrial and Residential area too. The sampling site has mangrove swamp vegetation with palm trees and plantain trees in the area, where there is a creek

The third site is a vegetable garden located in Okarki Street in Borokiri layout, Port Harcourt. This area is located south of Port Harcourt city after Harold Wilson Drive. It is purely a Residential area and the garden has green vegetation more of garden vegetables. The Borokiri garden site contained the following waste, food waste and leaves or decomposing plant materials. The sampling site being vegetable garden is used by the Resident occupants to dump their kitchen waste. The dump area is small compared to the other two aforementioned sites. Sampling stations were established on the vegetable garden site and were represented as station E and F.

Collection and treatment of soil samples

Waste dump soil samples were collected from the two established stations on each dump site using standard method. At each sampling station, the surface debris was removed and subsurface soil dug to a depth of about 5cm were scooped from one foot square area into sterile duplicate sampling black polythene bags and approximately labeled. Twelve (12) soil samples, two from each study site, were aseptically collected on each sampling visit. Samples were collected seven times at biweekly intervals. The soil samples were appropriately labeled and placed in a cool box containing ice packs and immediately transported to the laboratory and treated within 24 hours after collection. A total of 84 waste dump site soil samples were collected during the sampling period in the Months of April to July. The soil samples were air dried to obtain fine soil particles (U.S. EPA, 1978). One gram (1g) of each air-dried fine soil sample was mixed in a test-tube containing 9ml of sterile distilled water using a sterile spatula, after which is was vigorously agitated. This solution constitutes the original 10-1 dilution of propagules.

Collection and treatment or processing of the cucurbit roots

Cucurbit root sample collection was also carried out biweekly during the study period. At each sampling station, the root of the desired cucurbit plant was dug out with the aid of a sterile hand trowel and inserted into sterile duplicate sampling black polythene bags and approximately labeled. Six (6) root samples, two from each sampling station were collected on each visit. The root samples were transported to the laboratory and processed within twenty four (24) hours after collection.

The root samples were processed by carrying out a thorough washing of parts of the root required, to remove all soil and most of the loose, decayed plant tissue, in which most of the saprophytes are present (Ogbulie and Ojiako, 2000). Several small sections (5-10mm square) from the margin of the tissue area were cut. These were placed in one of the surface sterilant solutions (Clorox solution) making sure that the surface is wet. These were left for about 15 to 30 second and the sections were removed aseptically one by one for at least 5 to 10 second intervals, such that each of them has been surface sterilize for different times. The sections were dried on clean, sterile paper towels for different times (Ogbulie and Ojiako, 2000).

Cultivation and enumeration of fungi in the soil and root samples

Each sample (1g) of previously air dried fine soil and processed Cucurbit roots was thoroughly shaken in 9ml of sterile distilled water. Aliquot (1.0ml) of it was transferred into the next test-tube and diluted serially in one-tenth step wise to 10^{-3} dilution. From the dilution of 10^{-1} of each soil sample, 0.1ml aliquot was transferred aseptically onto freshly prepared potato Dextrose Agar (PDA) plates to which 0.2ml of 0.5% chloramphenicol has been added to inhibit the growth of bacteria and allowing the growth of fungi (Harrigan and McCance, 1990). The inoculum was spread with a sterile bent glass rod. The dilution of 10^{-1} was used in plating for fungi because the 10^{-2} and 10^{-3}dilutions gave scanty growth. The cultured plates were incubated in an inverted position at 28ºC for 5 to 7 days. The colonies which developed were counted and the average count for duplicate cultures was recorded as total viable fungi in a sample.

Purification of Fungal Isolates

Pure cultures of fungi were obtained by picking (with a sterile inoculating needle) discrete culturally and morphologically different colonies from the various plates. Each of these colonies were separately sub-cultured onto Sabouraud Dextrose Agar (SDA) plates and incubated at required at 28ºC for 3-5 days. Pure colonies devoid of contaminants obtained were preserved in SDA slants in the refrigerator (4ºC) as stock cultures for characterization and identification tests.

Macroscopic and microscopic examination of fungi isolated from the soils and Cucurbit roots

Macroscopic examination of fungal isolates was done by observing and recording the colony morphology, as with the diameter, colour or pigment production, texture, and surface appearance. The microscopic examination of fungal isolates was done by the needle mount or wet mount Lactophenol cotton blue method. A small portion of the fungal growth was picked with a sterile needle and teased out thinly in a drop of lactophenol cotton blue on a grease-free clean microscopic slide. The preparation was covered with a clean cover slip, taking care to exclude the air bubbles. The prepared slides were then examined under the microscope, starting with a low-power objective (x10) to the high power (x40) objective for a better field view and magnification and observing sexual and asexual reproduction structures like sporangia, conidia heads, arthrospores and the vegetative mycelium (Harrigan and McCance, 1990). The complete identification of the fungal isolates was concluded by comparing the results of their cultural, macroscopic and microscopic characteristics with those of known taxa (Haley and Callaway, 1978; Sarah *et al.*, 2016).

Statistical analysis

Statistical analysis of the data obtained was performed using analysis of variance (ANOVA).

Results

Table 1: Total fungi (mould and yeast) count of soil and cucurbit root samples of the waste dump sites

Sampling Period	Total Fungi (Mould and Yeast) Count (CFU/g)					
	Waste dump soil sample			Cucurbit root sample		
Days	Borokiri	Rugaraga	Eagle Island	Borokiri	Rugaraga	Eagle Island
1	1.70×10^3	9.00×10^2	5.00×10^2	4.50×10^2	3.80×10^2	2.00×10^2
14	1.50×10^3	1.10×10^3	6.00×10^2	6.50×10^2	2.40×10^2	2.30×10^2
28	5.00×10^2	1.00×10^3	1.50×10^3	5.50×10^2	4.80×10^2	4.00×10^2
42	1.70×10^3	1.10×10^3	1.60×10^3	1.00×10^3	1.20×10^3	7.80×10^2
56	1.00×10^3	2.30×10^2	2.00×10^3	1.80×10^3	2.50×10^1	2.30×10^2
70	3.10×10^3	1.60×10^3	3.00×10^3	2.60×10^3	2.80×10^2	2.80×10^2
84	2.50×10^3	6.00×10^2	6.00×10^2	2.30×10^3	2.00×10^3	2.30×10^2
Mean	1.71×10^3	9.33×10^2	1.40×10^3	1.33×10^3	6.57×10^2	3.35×10^2

The fungi isolated and identified during the study were *Alternaria conidia*, *Aspergillus fumigatus*, *Aspergillus niger*, *Candida albicans*, *Ceratocystis fimbriata*, *Fusarium* sp., *Gelasinospora calospora*, *Mucor Mucedo*, *Penicillium chrysogenum*, *Penicillium expansum*, *Rhizodiomyces apophysatus*, *Rhizopus stolonifer*, *Sacccharomyces* sp., and yeast.

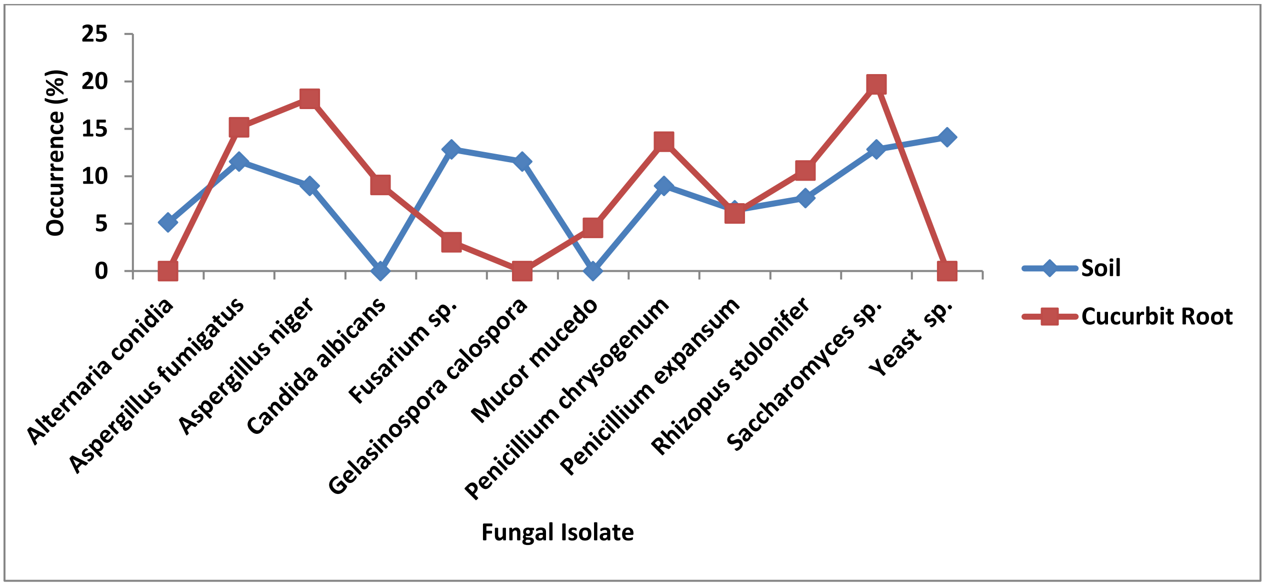

Fig. 1: Occurrence of fungi in soil and cucurbit root samples in Borokiri waste dump site

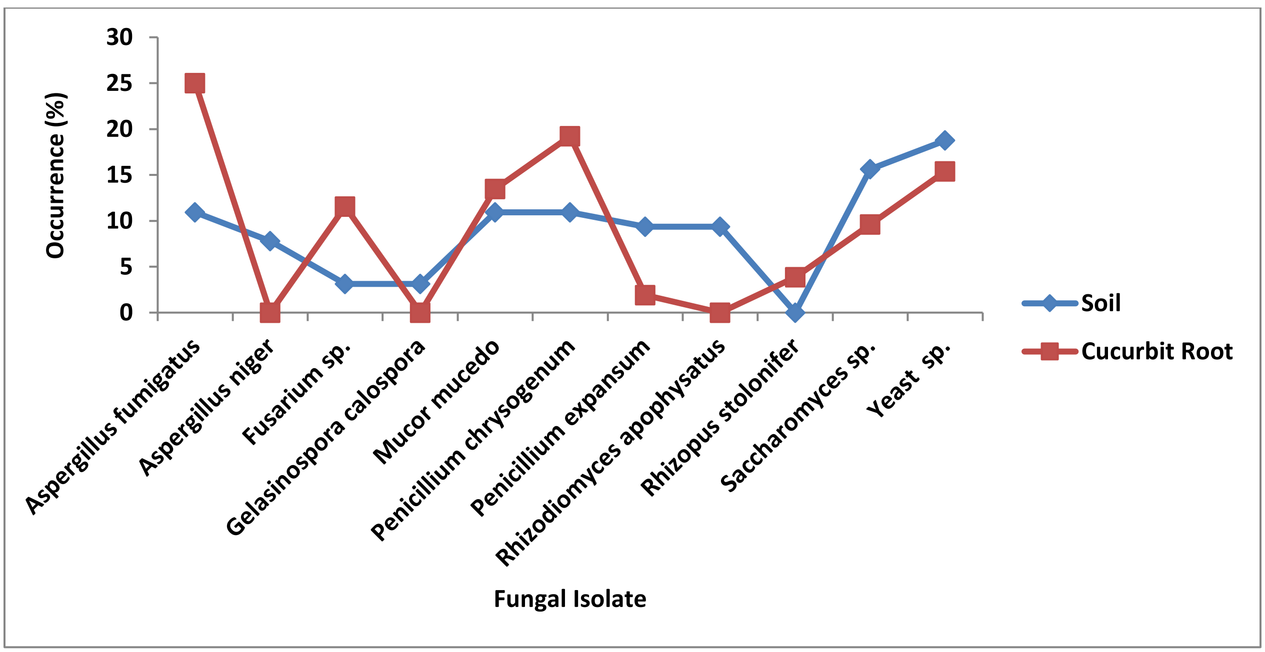

Fig. 2: Occurrence of fungi in soil and cucurbit root samples in Rugaraga waste dump site

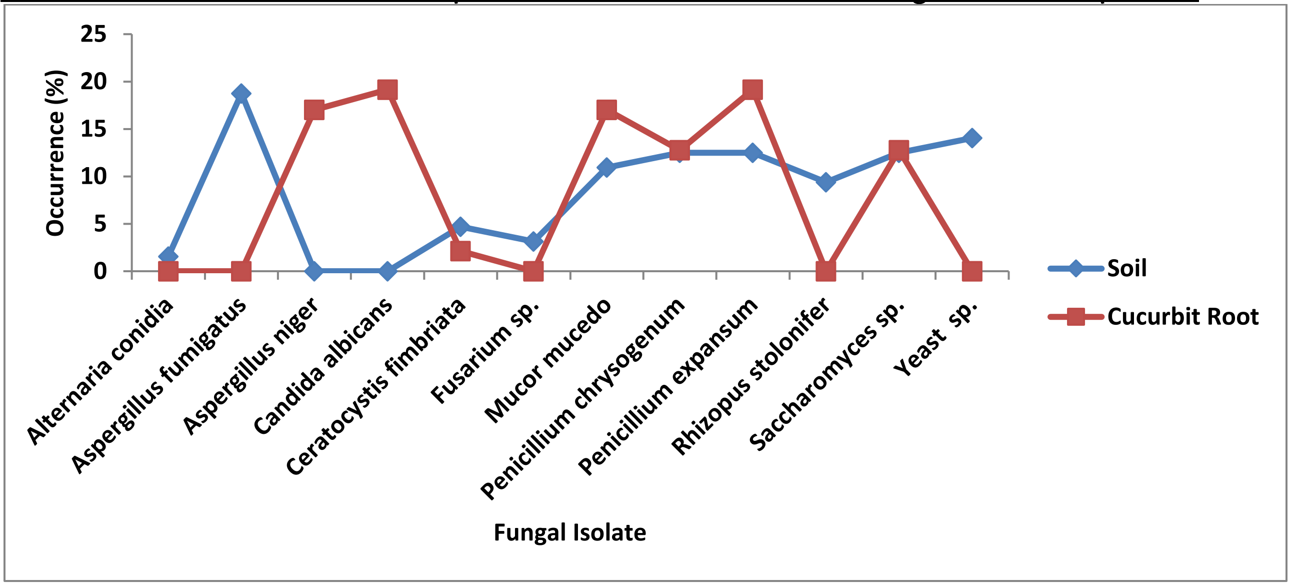

Fig. 3: Occurrence of fungi in soil and cucurbit root samples in Eagle Island waste dump

DISCUSSION

The present investigation has revealed the fungal population as well as fungal diversity and distribution in soils and root samples of cucurbits in the various wastes dump sites in Port Harcourt. The mean values of the total fungal (mould and yeast) counts of the soil and cucurbit root samples were generally moderate according to the specified standard (Cruishank *et al*., 1975). The mean values of the total viable fungal count for the waste dump soils in Borokiri, Rugaraga, and Eagle Island waste dump site soil samples were 1.71 x 10^3CFU/g, 9.3 x 10^2CFU/g and 1.40 x 10^3CFU/g soil respectively. The order of decreasing fungal counts in the dump soils was Borokiri > Eagle Island > Rugaraga. The mean total viable fungal population in the roots of Cucurbits in the waste dump sites of Borokiri, Rugaraga and Eagle Island were 1.34 x 10^3CFU/g, 6.6 x 10^2CFU/g, and 3.4 x 10^2CFU/g root respectively. The order of decreasing fungal counts in the roots of curcubits in the waste dump sites was Borokiri (*Lagenaria guineensis*) > Rugaraga (*Luffa aegyptica*) > Eagle Island (*Luffa aegyptica*). The means of total fungal (mould and yeast) population per gram of soil within the sampling sites were not significantly different at the 95% confidence level. Generally, the mould and yeast counts of the soil and root samples are similar. But statistical analysis, using analysis of variance (ANOVA) for the data obtained in the present investigation showed variability in number of mould and yeast at 95% confidence level among the three waste dump sites.

The present investigation has also shown that the nature of the microenvironment and niche, addition of waste and soil nutrients can affect microbial proliferation as reported by Marshall and Devinny (1998). Wei *et al*. (2024) also reported that the application of microbial fertilizers significantly increases the richness of soil microorganisms, maintains soil microecological balance, and effectively improves the soil environment.

The Borokiri waste dump site has the lowest population of fungi compared to the other waste dump sites. This is attributed to the fact that the Borokiri site is an old was dump site which is no longer active and therefore devoid of nutrients. The nature of the micro-environment, the type of waste and soil nutrients added was not on the favourable side compared to the other active waste dump sites. This is in agreement with the findings of Mandolini *et al*. (2021) and Naylor *et al*. (2022) who reported that the specific physical location of a microorganism is its microenvironment. In this physical microenvironment, the flux of required oxidants, reductants, and the nutrients to the actual location of the microorganisms can be limited thus affecting the microbial proliferation as seen in the case observed in the Borokiri site. While the physical structured environment also can limit the predatory activities of other microbes. Mandolini *et al*. (2021) and Naylor *et al*. (2022) also stated that if the microenvironment has pores with diameters of 3 to 6µm, microorganisms in the pores will be protected from predation, while allowing diffusion of nutrients and waste products, thus, increasing the microbial population in that niche. This is seen mostly in the case of the other waste dump sites with higher population of fungi.

The mould and yeast in the soil of the three study sites decreased in the sequence of Borokiri garden site > Eagle Island dump site > Rugaraga dump site. Similar pattern of findings have been reported by Obire *et al*. (2002). The fungi in this study have been found to follow a decreasing pattern in the sequence of root of *Lagenaria guineensis* of Borokiri site > root of *Luffa aegyptica* plant of Rugaraga dump site > root of *Luffa aegyptica* plants of Eagle Island dump site. There was variability in pattern of sequence for fungi in the roots of *Lagenaria guineensis* and *Luffa aegyptica* with counts being highest in the roots of *Lagenaria guineensis* during the study. Environmental factors and climate conditions the wet and rainy season, humidity and cold temperatures of April to July in the tropics may have contributed to the variation (Al-Shahwani *et al*., 1986; Ibebuchi and Abu, 2023).

The present study has revealed the types (diversity) of fungi from the soils and roots of cucurbits in Borokiri, Rugaraga and Eagle Island waste dump sites. The fungi isolated were *Alternaria conidia*, *Aspergillus fumigatus*, *Aspergillus niger*, *Candida albicans*, *Ceratocystis fimbriata*, *Fusarium* sp., *Gelasinospora calospora*, *Mucor mucedo*, *Penicillium chrysogenum*, *Penicillium expansum*, *Rhizodiomyces apophysatus*, *Rhizopus stolonifer*, *Saccharomyces* sp., and yeast specie. *Penicillium chrysogenum*, *Penicillium expansum*, and *Saccharomyces* species were isolated from both soil and root samples from all the dump sites. This affirms that these organisms are associated with the decomposition of solid waste. Bartholomew *et al*. (2023) also reported *Penicillium chrysogenum*, *Penicillium expansum*, and *Saccharomyces*. *Alternaria conidia* was isolated only from soil samples in Borokiri and Eagle Island dump sites. *Gelasinospora calospora* was isolated only from soil samples in Borokiri and Rugaraga; and *Rhizodiomyces apophysatus* was isolated only from soil samples in Rugaraga dump site. While *Candida albicans* was isolated only from curcubit root samples in Borokiri and Eagle Island dump sites. *Alternaria conidia*, *Gelasinospora calospora*, *Rhizodiomyces apophysatus*, were isolated from only dump soils while *Candida albicans* was isolated from only cucurbit roots. Ismail *et al*. (2020) reported the isolation of *Alternaria* form soil and plant debris. All the other fungal isolates were isolated from both waste dump soils and cucurbit roots. Also, all fungal general isolated in this study are potential pathogens except *Penicillium* (Bartholomew *et al*., 2023). Pavoni *et al*. (1975) and Jaganthan and Jayraaj (2012) reported that truly pathogenic forms may survive in waste. It is most likely that the presence of these potential pathogens reported in this investigation may be attributed in part to the disposal of human waste discharges and other waste emanating from human exudates at the waste dump sites (Obire *et al*., 2002). The implicating presence of these pathogenic organisms in open dump sites within the city of Port Harcourt might involve huge expenditure on public health and reduction in the productivity of the populace. On the other hand, *Fusarium, Mucor, Penicillum, Rhizopus* and a variety of yeast have been reported to be associated with waste biodegrdation (Ekundayo, 1977). *Aspergillus* and *Saccharomyces* were reported by Ikpendu (1980), while *Saccharomyces* and *Rhizopus* were reported by Sanni (1980).

The present investigation has revealed the presence of various fungi known to be associated with waste and cucurbit root. It has also revealed that the presence of cucurbits in soil is beneficial to the soil fertility. This is attributed to the fact fungi in the rhizosphere of cucurbits can enhance the uptake of nutrients and other elements or metals from the soil or waste dump site. Thus, the activities of these fungi (moulds and yeast) in conjunction with these plants if properly harnessed can be used in future treatment plants in Nigeria in accelerating the bioconversion of waste compost into organic fertilizer for use in gardening, agriculture and horticulture (Obire *et al.*, 2002).

Africa's agricultural viability and food security depend heavily on its soil quality (Wudil *et al*., 2022). To understand the potential for feeding the world on a sustainable basis, we need to know how soil forms, how it is lost, and what we can do to protect and rebuild good agricultural soil. The cucurbitaceae plants, well associated with the waste dump site are important in the agricultural sector; equally important are their death, decomposition and recycling. Cucurbits can therefore be used as fertilizers. Other economic importance of the cucurbits includes degradation in the environment, sales, medicine, and food (Solimani *et al*., 2010; Romo-Tovar *et al*., 2024).

In conclusion, the fungal genera reported in this study with the exception of *Penicillium* are potential pathogens. The health hazard associated with the indiscriminate dumping of waste around residential areas and other ecologically sensitive areas such as rivers and streams and arable land cannot therefore be under- estimated. Nigeria should therefore direct her efforts towards not only treatment of waste before disposal but also cultivate the habit of incorporating plants such as cucurbits that can withstand toxic condition of these waste dump sites in the treatment of waste as to minimize the health hazards associated with dumping of waste. Also, the activities of these fungi and yeast in conjunction with cucurbits can be properly harnessed such that it can be used in future treatment plants in Nigeria in accelerating the bioconversion of organic waste or compost into organic fertilizer for use in gardening, agriculture and horticulture.

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